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Liberiictis kuhni.

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Liberiictis Hayman, 1958

Liberiictis Hayman, 1958:448. Type species *Liberiictis kuhni* Hayman, 1958, by original designation.

CONTEXT AND CONTENT. Order Carnivora, Family Viverridae, Subfamily Herpestinae. The genus *Liberiictis* contains one species.

Liberiictis kuhni Hayman, 1958

Liberian Mongoose

Liberiictis kuhni Hayman, 1958:449. Type locality "Kpeaplay, north-east Liberia, about 6°36′N., 8°30′W., (not to be confused with another Kpeaplay at about 7°10′N., 8°35′W.)."

CONTEXT AND CONTENT. Context as in generic summary above. *L. kuhni* is monotypic.

DIAGNOSIS. *Liberiictis kuhni* is distinguished from mongooses of the genus *Crossarchus* by its large size, more robust body, neck stripes, reduced pollex and hallux, condylobasal length >86.5 mm, more elongated rostrum and nasal bones, presence of P1 and p1, P4 and m1 without carnassial shear, and proportionally smaller cheekteeth in relation to the greater size of skull (Hayman, 1958; Schlitter, 1974).

GENERAL CHARACTERS. *Liberiictis kuhni* is a medium-sized mongoose with a robust body and bushy tapering tail, which is <50% the length of the head and body (Fig. 1). Sexual dimorphism has not been reported in the Liberian mongoose; secondary sexual size dimorphism is not present in the related genus *Crossarchus* (Goldman, 1984). The forefoot is robust with a reduced pollex; digits two through five have large claws. The proximal one-third of the hind foot is hairy; externally the hallux is small. The longest claws on the third and fourth digits of the forefoot are 18 mm in length and of the hind foot 13 mm in length (Schlitter, 1974). The head tapers anteriorly with the snout extending beyond the lower lip; the ears are short and round.

There are conspicuous stripes along the neck. The pelage is uniformly dark brown except for the two pale stripes and one dark stripe on the neck from the base of the ear to the shoulder. The throat is pale, the tail is weakly bicolored, and the feet are dark brown (Schlitter, 1974).

The skull is long and narrow with an elongated and tapering rostrum (Fig. 2). The length of the rostrum and of the nasal bones average 38 and 25%, respectively, of the greatest length of the skull (Hayman, 1958). About 60% of the length of the skull in *L. kuhni* is anterior to the anterior rim of the orbit; in other mongoose genera this length is at most 50%. Zygomatic breadth is about 48% of condylobasal length (Rosevear, 1974). The postorbital process is small and does not form a complete postorbital ring; the zygomatic arch is relatively narrow; the palate is long and narrow; the anterior portion of the tympanic bulla is smaller than the inflated posterior portion and has a medial depression; mandibulae are slender. The post-dental palate is divided medially by a notch that is conspicuous in most specimens and about 3 to 4 mm in depth. Interorbital breadth is about equal to the postorbital constriction (Hayman, 1958).

The cheekteeth of *L. kuhni* are small in comparison to the size of the skull: length of P4 is 5.5% of the condylobasal length (86.5–95.7 mm), in *Crossarchus obscurus* the length of P4 is 6.9% of the condylobasal length (68.5–73.2 mm; Pagel, 1985). Cusps of the cheekteeth are adapted for "puncture crushing"; deciduous P1 and p1 are not shed (Pagel, 1985:146). The spaces between the premolars are wider in *L. kuhni* than in most mongoose genera. Upper molars are about equal in size; M2 is situated below the posterior root of the maxillary process; m1 and m2 are about equal in length. The dental formula is i 3/3, c 1/1, p 4/4, m 2/2, total 40.

External measurements (in mm) of an adult male and an adult female are as follows: length of head and body, 423, 478; length of tail, 197, 205; length of hind foot, 88 (with claw), 83 (without claw); length of ear, 30, 29; mass of the male specimen was 2.3 kg (H. Kuhn, in litt.; Schlitter, 1974).

The cranial measurements in mm (range, mean, and *n*; Hayman, 1958; Pagel, 1985; Schlitter, 1974; Taylor, 1989) are as follows: greatest length of skull, 94.7–100.4 (96.9) 12; condylobasal length, 86.5–95.7 (92.7) 16; zygomatic breadth, 42.2–47.0 (44.8) 15; palatal length, 50.3–56.3 (53.4) 12; distance between first upper molars, 25.1–28.0 (25.9) 12; distance between upper canines, 15.2–17.0 (16.1) 10; rostral length, 35.7–38.0 (36.9) 10; interorbital breadth, 16.6–18.5 (17.6) 12; postorbital constriction, 17.2–19.9 (18.7) 12; mastoid breadth, 33.5–34.8 (34.2) 12; nasal length, 22.0–26.4 (24.7) 8; bullar length, 16.5–17.8 (17.1) 9; bullar breadth, 10.7–12.5 (11.6) 9; length of maxillary toothrow, 31.6–34.5 (32.5) 10. The cranial capacity is 17.00 cc (J. L. Gittleman, pers. comm.). Ranges for measurements (in mm) of premolars and molars are: length of P1, 1.67–2.13; breadth of P1, 1.22–1.52; length of P2, 3.27–3.80; breadth of P2, 1.75–2.05; length of P3, 3.95–4.71; breadth of P3, 2.89–3.34; length of P4, 4.71–5.32; breadth of P4, 4.41–4.98; length of M1, 3.65–4.48; breadth of M1, 5.40–6.23; length of M2, 3.34–4.33; breadth of M2, 5.02–5.70; length of p1, 1.52–1.90; breadth of p1, 1.14–1.37; length of p2, 3.04–3.57; breadth of p2, 1.60–1.90; length of p3, 4.03–4.64; breadth of p3, 1.82–2.20; length of p4, 4.79–5.40; breadth of p4, 2.36–2.58; length of m1, 5.17–6.08; breadth of m1, 2.89–3.42; length of m2, 4.64–5.47; breadth of m2, 2.96–3.49 (Pagel, 1985). Limb bone measurements (in mm) of an adult female are as follows: length of humerus, 65.9; length of radius, 56.1; length of third metacarpal, 22.4; length of femur, 77.7; length of tibia, 77.9; length of third metatarsal, 31.6 (Taylor, 1989).

DISTRIBUTION. *Liberiictis kuhni* has been collected from seven localities in northeastern Liberia (Fig. 3): Gaplay (=Gaple; 7°08′N, 8°28′W); Kpeaplay (=Kpeaple; 6°36′N, 8°30′W); Tappita area (=Tapeta; about 6°30′N, 8°52′W); 20 mi SE Tapeta, Gbi National Forest (6°25′N, 8°45′W); near Nimbo When (=Nimbowehn), Gbi National Forest (6°12′N, 8°47′W), Nimba County; and "Frog-City" and Tar (both about 25 km N Zwedru (=Tchiehn; 6°13′N, 8°08′W), northern Grand Gedeh County (Hayman, 1958; H. Kuhn, in litt.; Schlitter, 1974; Taylor, 1989). *L. kuhni* may also occur in suitable habitats in western Ivory Coast and southern Guinea.

FIG. 1. Adult male Liberian mongoose (*Liberiictis kuhni*), collected about 20 mi SE Tapeta, Nimba Co., Liberia, 6 February 1989. Photograph by M. E. Taylor.

FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of *Liberiictis kuhni* (U.S. National Museum of Natural History 481997, male, from Tar, 25 km N Zwedru (=Tchiehn), Grand Gedeh Co., Liberia). Greatest length of cranium is 96.7 mm. Photographs courtesy of U.S. National Museum of Natural History, Washington, D.C.

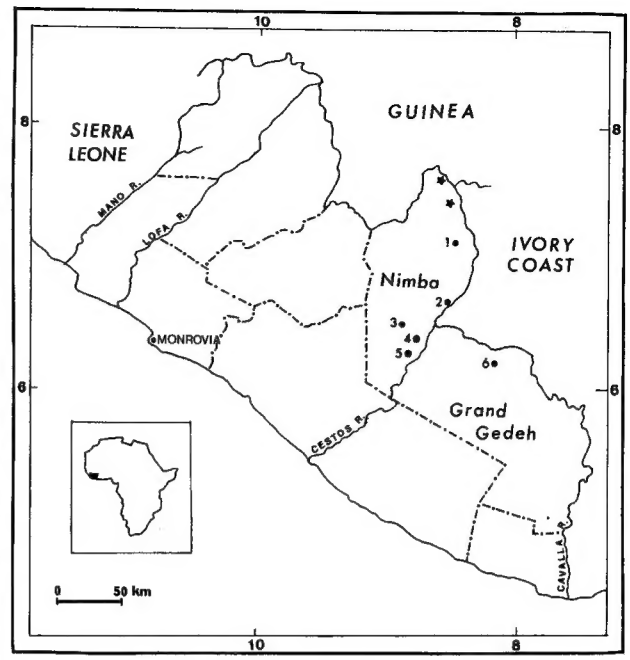

FIG. 3. Localities where specimens of *Liberiictis kuhni* have been collected: 1, Gaple; 2, Kpeaple; 3, Tapeta area; 4, 20 mi SE Tapeta; 5, near Nimbowehn; 6, "Frog City" and Tar. Symbol "*" indicates localities where individuals have been sighted.

Individuals have been observed in northern Nimba County (in 1964) near the top of the main ridge of Mount Nimba (7°30′N, 8°30′W; Coe, 1975) and in an area of primary and secondary forest (in 1978) between Sanniquellie (7°22′N, 8°43′W), Kahnplé (7°17′N, 8°30′W), and the Ivory Coast border (Schreiber et al., 1989). There is no fossil record for *Liberiictis*.

FORM AND FUNCTION. Characteristics of the pelage are based on an adult male nearing the completion of molt (Schlitter, 1974). The dominant color of the pelage, derived from long guard hairs, is between blackish-brown and bone-brown, nearer blackish-brown. Guard hairs of the mid-dorsum average 40 mm in length; the distal portion is dark in color (5 mm) with a pale intermediate portion (5–12 mm) and dark proximal portion (18–26 mm). The apricot-buff subterminal band of the guard hairs gives *L. kuhni* a brindled appearance. Dense underfur ranges from pale-ochraceous to dark blackish-brown. A dark stripe, bordered above and below by a pale stripe (Fig. 1), is present on the neck from the base of the ear to the shoulder; the dark stripe is near blackish-brown, pale stripes near pale ochraceous-buff. Hairs of the ventral neck stripe are longest of the three stripes and about 22 mm in length; pale distal and proximal portions with blackish-brown intermediate portion. Dorsal hairs on the head are about 8 mm in length with dark distal and proximal portions and pale intermediate portion. The long rhinarium is black. The vibrissae are short, sparse, and entirely black. The throat is pale ochraceous-buff with hairs averaging 10 mm in length; pale distal and proximal portions with dark intermediate portion. The tail is bushy and tapers evenly from base to tip, with the longest hairs 40 mm in length; pale distal portion followed by one pale and one dark portion with a dark base. Dorsally the hairs of the tail appear brindled as on the dorsum, but ventrally the predominant color is pale ochraceous-buff, giving the tail a slight bicolored appearance. Hairs of the venter are short, stiff, and completely black, lax and grayish-brown, or a continuation of the apricot-buff hairs of the dorsum. Forelegs and hind legs become progressively darker distally; the forefeet and hind feet are almost uniformly near blackish-brown. Pads of the forefeet and hind feet are black. The dorsal and ventral pelage of the body of a juvenile female specimen has soft and lax underfur with occasionally pale-tipped or entirely black guard hairs (Schlitter, 1974).

In *L. kuhni*, the auriculo-labialis muscle, derived from the profound constrictor, is absent; the maxillo-naso-labialis and levator nasi muscles are well developed; the jaw muscles are poorly developed in relation to body mass, with the exception of the lateral pterygoid; in percentage of total body mass the temporalis is the largest jaw muscle (Pape, 1980). There are 7 cervical, 13 thoracic, 7 lumbar, 3 sacral, and 19 caudal vertebrae (Taylor, 1989).

The upper incisors are small: I1 and I2 are about equal in length; I3 is larger than I1 and I2 and separated by a distinct gap. The canines are well developed and medio-laterally compressed. The first upper premolar is separated from the canine by a distinct gap; P2 has two roots and is about twice the size of P1; P3 has three roots and a distinct medial heel; P4 is small, the protocone is larger than the metacone and paracone and there is no shearing metastyle. Cusps of the cheekteeth have a large trigon pit and small shearing surface, which indicate an adaptation to "puncture crushing" rather than shearing (Pagel, 1985:146). The first upper molar is almost as large as P4, with a well-developed protocone, paracone, and metacone; M2 is well developed and almost as large as M1, all three cusps are present. The lower incisors are markedly procumbent and smaller than the upper incisors. The lower premolars increase in size and complexity from p1 to p4; p3 has a slight posterior heel; p4 has a well-developed protoconid, small paraconid and metaconid, and a distinct talonid. The first lower molar has a well-developed protoconid, paraconid and talonid, the metaconid is small; m2 is about as large as m1 and is distinguished by the absence of a metaconid.

ONTOGENY AND REPRODUCTION. Three juveniles of *L. kuhni* were collected on 31 July (H. Kuhn, in litt.). One juvenile female was excavated from a burrow on 29 July (Schlitter, 1974). A lactating female was found on 3 August (H. Kuhn, in litt.). This information suggests that breeding coincides with the rainy season (May–September) when food is more abundant.

ECOLOGY. *Liberiictis kuhni* is diurnal and terrestrial. It is believed to be restricted to habitats with deep sandy soil (Pagel, 1985). Specimens have been collected from localities in the evergreen-rainforest zone (Tapeta area, 20 mi SE Tapeta) and moist semi deciduous-forest zone (Gaple, Kpeaple, and Tar); both zones are collectively known as high forest (von Gnielinski, 1972). Schlitter (1974:438) described the terrain north of Zwedru, where two specimens were collected, as "undulating, covered by cutover high forest, and transversed by numerous small streams .... Slash and burn agriculture is practiced, and the forest is interspersed with numerous plots in various stages of regeneration. Some bands of near climax forest exist along the streams but the remaining forest is secondary, with the understory consisting of nearly impenetrable undergrowth." Concessions for lumbering have been issued for most of the forested areas in northeastern Liberia (A. L. Peal, pers. comm.).

The diet of *L. kuhni* may consist of earthworms (Oligochaeta) and Coleoptera larvae (Schreiber et al., 1989). Sand may be ingested with food items (Pagel, 1985). A captive Liberian mongoose at the Metro Toronto Zoo is fed ground meat, commercial dry dog food, 2-day-old chicks, and fresh fish (J. S. Carnio, pers. comm.). Adaptations for eating soft-bodied invertebrates are relatively weak masticatory muscles (Pape, 1980), reduced cheekteeth, and loss of the shearing functions of premolars and molars.

Carnivores that occur in the same general area as *L. kuhni* include the terrestrial *Atilax paludinosus*, *Crossarchus obscurus*, *Herpestes sanguineus*, *Mellivora capensis*, *Profelis aurata*, and *Viverra civetta*; the semi-aquatic *Aonyx congica* and *Lutura maculicollis*; and the arboreal *Nandinia binotata*, *Genetta maculata*, *G. johnstoni*, and *Poiana richardsoni* (Haltenorth and Diller, 1980; Rosevear, 1974; Taylor, 1989). *Felicola liberiae* (Mallophaga: Trichodectidae) was described from *L. kuhni* (Emerson and Price, 1972).

Liberiictis kuhni is hunted for food using shotguns and snares. An adult male was caught in a wire snare set on the ground; a juvenile female and adult of unknown sex were excavated from a burrow that was associated with a termite mound (Schlitter, 1974). A young adult male (Fig. 1) was collected alive in the Gbi National Forest on 6 February 1989 by a villager. It was caught in a snare and after treatment in Liberia was transported to the Metro Toronto Zoo, Canada. This individual is the first known specimen of *L. kuhni* to be exported alive from Liberia and exhibited in a zoological park. Attempts to catch *L. kuhni* in live traps have proved unsuccessful.

REMARKS. Skulls of *L. kuhni* were first obtained from Gio hunters in 1957 and 1958 by H. Himmelheber near the upper Cestos River (the Gio of neighbouring Ivory Coast are known as Dan; von Gnielinski, 1972). Due to the restricted range of the Liberian mongoose and because it is subject to heavy hunting, the IUCN/SSC Mustelid and Viverrid Specialist Group recommended the establishment of a captive breeding program to safeguard against extinction (Schreiber et al., 1989). *L. kuhni* is known from 27 specimens in museum and private collections (H. Kuhn, in litt.; Taylor, 1989). Gio people refer to the Liberian mongoose as "wan"; Gbi people in southern Nimba County use "tuoba" (Taylor, 1989); Krahn people in Tar use "bagou" (Schlitter, 1974); Krahn people in Nimba County use "boire-senna" (Walker, 1964).

Some authors include the Herpestinae and Galidiinae in a separate family, the Herpestidae. Honacki et al. (1982:272) suggested that *Crossarchus* "may include *Liberiictis*." Until the relationships between these genera are studied in more detail *Liberiictis* should be retained as distinct at the generic level (Goldman, 1987).

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